

REMARKS

The application has been carefully reviewed in light of the Office Action dated June 13, 2005. Claims 1-12 are pending. Claims 1, 4, 11 and 12 have been amended in this response. New Claims 13 - 24 have been added. No new matter is believed to be added by these amendments and new claims. In addition, unless a passage of an amendment is specifically discussed below in connection with one or more cited references, Applicants respectfully submit that the amendments to the claims should be constructed as being submitted merely to clarify the invention rather than as a limitation submitted to overcome a cited reference.

Rejection under 35 U.S.C. § 102(b)

Claim 1 stands rejected under 35 U.S.C. § 102(b) as anticipated by Cornelius. Applicants respectfully traverse this rejection and request reconsideration. In the Office Action, the Examiner suggests that Cornelius discloses a crucible with a capillary tube mounted on top for vapor deposition of materials such as metals. The Examiner states that the capillary tube, as disclosed, is inherently a nozzle pipe, or could at least obviously be a nozzle pipe. The Examiner further points out that Cornelius discloses that the crucible and capillary tube have separate heaters.

Cornelius discloses an apparatus for vapor deposition onto a substrate, where the crucible 10 is a closed body formed from a lower cylindrical vessel 16 and a lid 18. A small diameter aperture is provided in the lid, where the capillary tube is inserted. The capillary tube is bent from the vertical direction to the horizontal direction to deflect the vapor at the substrate.

Claim 1, as currently amended, reads:

1. A device for vapor deposition of vertically aligned regions of a substrate, comprising:
a melting crucible having a crucible heater for melting and vaporizing material poured into the melting crucible; and

a nozzle pipe for deflecting the vapor flowing out of the crucible horizontally toward the substrate, the nozzle pipe comprising:

- a lateral surface;
- a horizontal vapor outlet in its lateral surface;
- a coaxial filling opening positioned substantially on an upper end of the nozzle pipe;
- a sealing mechanism positioned above the filling opening for selective sealing of the filling opening, and
- a pipe heater which is independent of the crucible heater;

wherein the nozzle pipe is placed from above the melting crucible.

In order for a reference to qualify as prior art under 35 U.S.C. § 102, the reference must "anticipate" the claimed invention. This means that the reference must disclose each and every element of the claimed invention. *See In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997); *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047 (Fed. Cir. 1995); *Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991); *Verdegaal Bros. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). In contrast to the present invention, Cornelius does not contain a coaxial filling opening positioned substantially on an upper end of the nozzle pipe. Also, Cornelius does not have a sealing mechanism for selective sealing of the filling opening. Lastly, Cornelius does not have a nozzle pipe with a horizontal vapor outlet in its lateral surface. Accordingly, the Sec. 102 rejection of Claim 1 should be withdrawn.

Rejections under 35 U.S.C. § 103

Claims 1, 11, and 12 stand rejected as obvious under 35 U.S.C. § 103(a). Applicants respectfully traverse the rejections and request reconsideration.

Claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakabayashi (JP 2001-192293), taken in view of Nicol (U.S. Patent No. 3,603,285), Cole (U.S. Patent No. 3,867,183), Witzman (U.S. Patent No. 6,202,591) and Goldstein (U.S. Patent No. 5,321,260), taken in view of Witzman alone, as well as in view of Cornelius (U.S. Patent No. 3,661,117) alone.

The Examiner asserts that Nakabayashi discloses a vapor source for supplying vapor in a lateral direction. The Examiner states that Nakabayashi includes a crucible and nozzle pipe, each with separate heaters. The Examiner also asserts that the Nichol, Cole, Witzman, and Goldstein references all disclose vapor sources having a nozzle pipe mounted on the top of the crucible, and that they all teach that the nozzle pipe can be separate from the crucible.

Nakabayashi discloses a crucible with a nozzle pipe mounted above a crucible for vapor deposition onto a substrate. In one embodiment, the nozzle pipe is bent in order to form a horizontal vapor outlet. Nichol discloses a tube 20 connected to a crucible 19, each having their own heaters. The exit part of the tube is bent in the direction of the center of the substrate.

Cole discloses a pair of interconnected right-angularly related tubular sections 26 and 28 in fluid communication with a crucible. As asserted by the Examiner, Goldstein discloses a vapor source with a separate nozzle pipe. However, the nozzle pipe disclosed in the '260 patent has a vertical outlet.

The Examiner also asserts that Witzman discloses a crucible with a nozzle pipe mounted on top of the crucible, whereby the nozzle pipe deflects vapor from the crucible into a horizontal direction and delivers the vapor to a vertically aligned substrate. The Examiner states that it would have been obvious to mount the nozzle pipe of Witzman thereon the crucible in a manner similar to the present invention.

Witzman discloses a number of distinct embodiments of a vapor deposition device. Figs. 3A, 3C, 6B, 7, and 8 all disclose a crucible with a nozzle pipe mounted thereon for vertical vapor deposition. Fig. 14A of Witzman discloses a crucible with a vertical chimney. The chimney has a vertically disposed floating baffle and a vertical opening to deposit a coating material onto a substrate.

The Office Action fails to establish a *prima facie* case of obviousness of the subject matter of amended Claim 1. Courts have generally recognized that a showing of *prima facie* of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the references' teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all of the claim limitations. See e.g., In re Dembiczak, 175 F. 3d 994 (Fed. Cir. 1999); In re Rouffet, 149 F.3d. 1350, 1355 (Fed. Cir. 1998); Pro-Mold & tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996).

The combination of references used in the rejection of Claim 1 fails at least one of the above noted prongs of obviousness. None of the references disclose a coaxial filling opening that is positioned substantially on an upper end of the nozzle pipe, nor do they disclose a sealing mechanism positioned above the filling opening for selective sealing of the filling opening. One of the benefits of having a coaxial filling opening is that the nozzle pipe does not have to be disengaged from the crucible in order to fill it with material to be vaporized. Additionally, since the filling opening comprises a sealing mechanism, the vapor exits exclusively out of the vapor outlet in the lateral side of the nozzle pipe.

Accordingly, one skilled in the art would not have been motivated to modify Nakabayashi, Nicol, Cole, Witzman, Goldstein, and Cornelius to arrive at the claimed invention having a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, or a sealing mechanism positioned above the filling opening for selective sealing of the filling opening. Nor is there any suggestion of such a design.

As noted above, in regard to Claim 1 of the application, there is no teaching in the cited references, as modified, to use a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, or a sealing mechanism positioned above the filling opening for selective sealing of the filling opening. Nakabayashi, Nicol, Cole and Cornelius have bent nozzle pipes, while Goldstein has a vertical outlet. Witzman has a horizontal outlet, but does not have an opening on the upper end of the nozzle pipe. This is in contrast to the present

invention in which the nozzle pipe is vertical, but has a horizontal outlet. The nozzle pipe also acts as a filling port.

There is certainly no teaching nor suggestion in the above references, as modified, to require an additional element, such as sealing mechanism of the present invention. Thus, a modification to use a sealing mechanism for selective sealing of the filling port would require hindsight reasoning, which the Federal Circuit has explicitly rejected. *See In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992) ("Here, the Examiner relied upon hindsight to arrive at the determination of obviousness. It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious."). Further, the Federal Circuit has stated that such a suggestion is essential to support an obviousness rejection of an invention based upon a modification of prior art. *See In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992) ("The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification."). Here, since no suggestion exists to modify the prior art to arrive at the claimed invention, an obviousness rejection would be inappropriate.

Therefore, independent Claim 1, as amended, would not be rendered obvious by these references. Likewise, the claims that depend from Claim 1 would also not be rendered obvious. *See In re Fine*, 5 U.S.P.Q.2d 1569, 1600 (Fed. Cir. 1988) ("Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.").

Independent Claim 11, as well as dependent Claims 5, 6, stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakabayashi taken in view of Nichol, Cole, Witzman, and Goldstein for the same reasons as Claim 1, taken further in view of Streetman (U.S. Patent No. 5,034,604). Additionally, independent Claim 11, as well as dependent Claims 5, 6, stand rejected under U.S.C. § 103(a) as being unpatentable over Witzman in view of Remondiere (U.S. Patent No. 4,880,960) and Nakabayashi. The rejection of pending dependent Claims 5

and 6 is moot as there are dependent upon independent Claim 1, which the applicants have argued above as being in a condition for allowance.

The Examiner states that Nakabayashi teaches the use of a heat reflecting shield surrounded by a housing, while Streetman discloses a heat shield surrounding a vapor source crucible formed from plural layers of heat reflectors. Streetman discloses a device and method for producing an ultra pure molecular beam of elemental molecules utilizing a reduced thermal gradient filament construction in an effusion cell is provided. A heat shield is positioned proximate and about the crucible and heating filament or filaments. The heating filaments are connected to a controllable electric power supply producing a near constant temperature along the long axis of the crucible.

The Examiner also asserts that Remondiere teaches the use of heat radiation reflectors around a nozzle pipe and that a vapor passage window should be provided in the reflectors at the location of a lateral vapor outlet. Remondiere discloses a crucible surrounded by one or several reflectors for heat protection. The crucible and reflectors possess windows allow passage of vapors. A heating device enables the reflectors to be maintained at a temperature higher than the evaporation temperature of the material.

As amended, Claim 11 reads:

11. A device for vapor deposition of vertically aligned regions of a substrate, comprising:

a melting crucible having a crucible heater for melting and vaporizing material poured into the melting crucible; and

a nozzle pipe for deflecting the vapor flowing out of the crucible horizontally toward the substrate, the nozzle pipe comprising:

a lateral surface;

a horizontal vapor outlet in its lateral surface;

a coaxial filling opening positioned substantially on an upper end of the nozzle pipe;

a sealing mechanism positioned above the filling opening for selective sealing of the filling opening, whereby, when engaged, the sealing mechanism holds the upper end of the nozzle pipe in coaxial alignment with the melting crucible; and
a pipe heater which is independent of the crucible heater;
wherein the nozzle pipe is placed from above the melting crucible and is enclosed concentrically by multiple reflectors, the reflectors comprise a vapor passage window in the region of the vapor outlet.

It should be noted that amended Claim 11 has all of the elements of amended Claim 1, in addition to the elements of previously presented Claim 5. Therefore, as discussed herein above, the references used in this Office Action fail one or more prongs of obviousness, in that, none of the references disclose a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, nor do they disclose a sealing mechanism positioned above the filling opening for selective sealing of the filling opening.

The combination of references used in the rejection of Claim 11 fails at least one of the above noted prongs of obviousness. None of the references disclose a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, nor do they disclose a sealing mechanism positioned above the filling opening for selective sealing of the filling opening. Additionally, none of the references teach a sealing mechanism that, when engaged, holds the upper end of the nozzle pipe in coaxial alignment with the melting crucible. As mentioned herein above, one of the benefits of having a coaxial filling opening is that the nozzle pipe does not have to be disengaged from the crucible in order to fill it with material to be vaporized. Additionally, since the filling opening comprises a sealing mechanism, the vapor exits exclusively out of the vapor outlet in the lateral side of the nozzle pipe. Lastly, the sealing mechanism as claimed in Claim 11 also serves to hold the nozzle pipe in coaxial alignment with the melting crucible.

Accordingly, one skilled in the art would not have been motivated to modify Nakabayashi, Nichol, Cole, Witzman, Goldstein, Streetman or Remondiere to arrive at the

claimed invention having a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, or a sealing mechanism positioned above the filling opening for selective sealing of the filling opening and for holding the nozzle pipe in coaxial alignment with the crucible. Nor is there any suggestion of such a design.

As noted above, there is no teaching in references above, as modified, to use a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, or a sealing mechanism positioned above the filling opening for selective sealing of the filling opening and for holding the nozzle pipe in coaxial alignment with the crucible. Nakabayashi, Nicol, Cole and Cornelius have bent nozzle pipes, while Streetman, Remondiere and Goldstein have vertical outlets. Witzman has a horizontal outlet, but does not have an opening on the upper end of the nozzle pipe. This is in contrast to the present invention in which the nozzle pipe is vertical, but has a horizontal outlet and also acts as a filling port.

There is certainly no teaching nor suggestion in the above references, as modified, to require an additional element, such as sealing mechanism of the present invention. Thus, a modification to use a sealing mechanism for selective sealing of the filling port would require hindsight reasoning, which the Federal Circuit has explicitly rejected. Since, as mentioned herein above, the Federal Circuit has stated that such a suggestion is essential to support an obviousness rejection of an invention based upon a modification of prior art and since no suggestion exists to modify the prior art to arrive at the claimed invention, an obviousness rejection would be inappropriate.

Therefore, independent Claim 11, as amended, would not be rendered obvious by this reference.

Independent Claim 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Witzman taken in view of Makino (U.S. Patent No. 3,417,733) and in view of Pundsack (U.S. Patent No. 3,971,334) or Timmons (U.S. Patent Application 2002/0078894).

The Examiner asserts that Makino discloses a vapor source which has holes on its side to direct vapor laterally onto vertically aligned substrate surfaces to be coated. The Examiner states that Makino teaches that it is desirable to provide a truncated cone shape having a coaxial filling opening at the top of the nozzle pipe. Makino discloses an apparatus for vacuum coating articles wherein a vertically disposed evaporation bath disperses coating material in a horizontal direction to the articles being coated. In Makino, the articles are rotated about an axis in order to completely coat the surface of the article.

The Examiner also states that Pundsack and Timmons both disclose vaporizers in which fill plugs are used to close fill ports. Pundsack discloses a device for coating a condensed metallic vapor onto a confined area of a substrate wherein the crucible producing the vapor is dimensionally stabilized and contains a variable aperture positioned relative to the vapor exit means of the crucible so as to provide a restricted line-of-sight path of travel for the vapors from the reservoir to the substrate being coated. Pundsack discloses that, to conveniently fill reservoir 11, plug 47 can be removed leaving an opening through end member 25. Timmons discloses dual chambered bubbler designs for use with solid organometallic source material for chemical vapor phase deposition systems, and a method for transporting a carrier gas saturated with source material for delivery into such systems.

As amended, Claim 12 reads:

A device for vapor deposition of vertically aligned regions of a substrate, comprising:

- a melting crucible having a crucible heater for melting and vaporizing material poured into the melting crucible; and

- a nozzle pipe for deflecting the vapor flowing out of the crucible horizontally toward the substrate, the nozzle pipe comprising:

- a lateral surface;

- a horizontal vapor outlet in its lateral surface;

- a coaxial filling opening positioned substantially on an upper end of the nozzle pipe;

- a pipe heater which is independent of the crucible heater;

- a taper shaped like a truncated cone on its upper end; and

a plunger having an adjustable height for selective engagement with the coaxial filling opening from above, whereby, when engaged, the plunger holds the upper end of the nozzle pipe in coaxial alignment with the melting crucible;
wherein the nozzle pipe is placed from above the melting crucible.

Claim 12, as amended, contains all of the elements of amended Claim 1 along with the elements of amended Claim 4. Therefore, as discussed herein above in regard to Claim 1, the references used in this rejection of Claim 12 fail at least one of the above noted prongs of obviousness. None of the references cited in reference to Claim 12 disclose a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, nor do they disclose a sealing mechanism positioned above the filling opening for selective sealing of the filling opening whereby the vapor is forced to exit through lateral holes in the nozzle pipe. Additionally, none of the references teach a sealing mechanism that, when engaged, holds the upper end of the nozzle pipe in coaxial alignment with the melting crucible. As mentioned herein above, one of the benefits of having a coaxial filling opening is that the nozzle pipe does not have to be disengaged from the crucible in order to fill it with material to be vaporized. Additionally, since the filling opening comprises a sealing mechanism, the vapor exits exclusively out of the vapor outlet in the lateral side of the nozzle pipe. Lastly, the sealing mechanism as claimed in Claim 12 also serves to hold the nozzle pipe in coaxial alignment with the melting crucible.

Accordingly, one skilled in the art would not have been motivated to modify Witzman, Goldstein, Makino, Pundsack, or Timmons to arrive at the claimed invention having a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, or a sealing mechanism positioned above the filling opening for selective sealing of the filling opening and for holding the nozzle pipe in coaxial alignment with the crucible. Nor is there any suggestion of such a design.

As noted above, there is no teaching in references above, as modified, to use a coaxial filling opening positioned substantially on an upper end of the nozzle pipe, or a sealing

mechanism positioned above the filling opening for selective sealing of the filling opening and for holding the nozzle pipe in coaxial alignment with the crucible. Goldstein has a vertical outlet. Witzman has a horizontal outlet, but does not have an opening on the upper end of the nozzle pipe. Makino doesn't disclose a sealing mechanism. Pundsack doesn't have a nozzle pipe at all, and has a plug in the sidewall of the reservoir. This is in contrast to the present invention in which there is a vertical nozzle pipe with a coaxial filling port that has a sealing mechanism for selective sealing of the filling port.

There is certainly no teaching nor suggestion in the above references, as modified, to require an additional element, such as sealing mechanism of the present invention. Thus, a modification to use a sealing mechanism for selective sealing of the filling port, which is coaxial with the nozzle pipe, would require hindsight reasoning, which the Federal Circuit has explicitly rejected. Since, as mentioned herein above, the Federal Circuit has stated that such a suggestion is essential to support an obviousness rejection of an invention based upon a modification of prior art and since no suggestion exists to modify the prior art to arrive at the claimed invention, an obviousness rejection would be inappropriate. Therefore, independent Claim 12, as amended, would not be rendered obvious by this reference.

New Claims

Independent Claim 14 and Claims 15 – 24, which depend therefrom, have been added in this response. Claim 14 is derived from the currently amended Claim 1 and the previously presented Claims 5 and 6.

As mentioned herein above, Claims 5 and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakabayashi taken in view of Nichol, Cole, Witzman, and Goldstein for the same reasons as Claim 1, taken further in view of Streetman (U.S. Patent No. 5,034,604). Again, Claims 5 and 6 also stand rejected under U.S.C. § 103(a) as being unpatentable over Witzman in view of Remondiere (U.S. Patent No. 4,880,960) and Nakabayashi.

New Claim 14 reads as follows:

A device for vapor deposition of vertically aligned regions of a substrate, comprising:

- a melting crucible having a crucible heater for melting and vaporizing material poured into the melting crucible;

- an elongate nozzle pipe placed from above the melting crucible for deflecting the vapor flowing out of the crucible horizontally toward the substrate, the nozzle pipe comprising:

- a lateral surface;

- a horizontal vapor outlet comprising a plurality of holes therein the lateral surface; and

- a pipe heater which is independent of the crucible heater;

- a plurality of reflectors concentrically enclosing the nozzle pipe, the reflectors comprising a vapor passage window in the region of the vapor outlet; and

- a vaporizer housing externally enclosing the reflectors, the vaporizer housing comprising a plurality of external cooling pipes extending substantially the elongate length of the nozzle pipe and an exhaust opening, wherein the exhaust opening is in the region of the vapor passage window and the vapor outlet.

Applicants believe that Claim 14 is in condition for allowance. However, if the Examiner believes that the noted obviousness rejection of previously presented Claims 5 and 6, could be applied to new Claim 14, applicants will address the rejection of Claims 5 and 6. The references used in this Office Action to reject Claims 5 and 6 fail one or more prongs of obviousness as it relates to Claim 14, in that, none of the references disclose cooling pipes that extend substantially the elongate length of the nozzle pipe. The cooling jacket of Nakabayashi only extends partially along the nozzle pipe. The temperature of the nozzle pipe can reach over 1600 degrees Celsius and could lead to damage of the substrate passing the device while being covered with vapor. To avoid such damage, the depositing device needs to be cooled. Since the nozzle pipe of Nakabayashi is bent, there is no way to sufficiently cool the portion of the cooling pipe adjacent the substrate. Similarly, the cooling vessel disclosed in Witzman is only disclosed in the embodiment without the lateral vapor outlet (see Fig. 3A). The Examiner

contends that Fig. 14A discloses a lateral vapor outlet. As such, Fig. 14A discloses a cooling jacket that does not extend along the chimney.

Accordingly, one skilled in the art would not have been motivated to modify Nakabayashi, Nichol, Cole, Witzman, Goldstein, Streetman or Remondiere to arrive at the claimed invention having cooling pipes that extend substantially the elongate length of the nozzle pipe. Nor is there any suggestion of such a design. Nakabayashi, Nicol, Cole and Cornelius have bent nozzle pipes, where it would not be practicable to have the cooling pipes extend to the end of the nozzle pipe because a portion of the nozzle pipe would still be adjacent the substrate. Streetman, Remondiere and Goldstein have vertical outlets, which presents a similar issue, wherein the substrate is adjacent a portion of the nozzle pipe. This is in contrast to the present invention in which the nozzle pipe is vertical, but has a horizontal outlet. The cooling pipes extend substantially the length of the nozzle pipes and are, by necessity, between the nozzle pipe and the substrate.

Thus, there is no teaching nor suggestion in the above references, as modified, to require cooling pipes that extend substantially the elongate length of the nozzle pipe. Thus, a modification to use cooling pipes that extend substantially the elongate length of the nozzle pipe would require hindsight reasoning. Since, as mentioned herein above, the Federal Circuit has stated that such a suggestion is essential to support an obviousness rejection of an invention based upon a modification of prior art and since no suggestion exists to modify the prior art to arrive at the claimed invention, an obviousness rejection of new independent Claim 14 would be inappropriate. Likewise, the claims that depend therefrom would also not be rendered obvious.

Therefore, applicants respectively submit that Claims 1 – 24 are in condition for allowance.

In view of the above, each of the presently pending and newly presented claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Payment in the amount of \$2,210.00 (\$1,020.00 for a three-month extension of time fee, \$790.00 for a RCE filing fee, and \$400.00 for the excess claims fee) is to be charged to a credit card and such payment is authorized by the signed, enclosed document entitled: Credit Card Payment Form PTO-2038. No additional fees are believed to be due; however, the Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 14-0629.

Respectfully submitted,

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Date